

Mars Habitability, Biosignature Preservation, and Mission Support

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Scientists and researchers at Johnson Space Center (JSC) have been studying the Martian surface to identify areas of past habitability with enhanced potential to preserve biosignatures. One area has been singled out in southern Acidalia Planitia/northern Chryse Planitia of the Martian lowlands. This area is predicted to have accumulated thick sequences of fine-grained sediments that could include preserved biosignatures. The area also contains tens of thousands of mud-volcano-like mounds (e.g., figure 1).

Mud volcanoes on Mars could have provided long-lived conduits for fluid movement from depth to the surface (figure 2), microhabitats for in-situ, endolithic life (figure 3), and a mechanism for transporting samples from depth to the surface where they could be accessed by future rovers. In response to a call by the Mars Program for imaging targets for future landing site candidates, JSC submitted multiple sites from the Chryse/Acidalia region of potential mud volcanism.

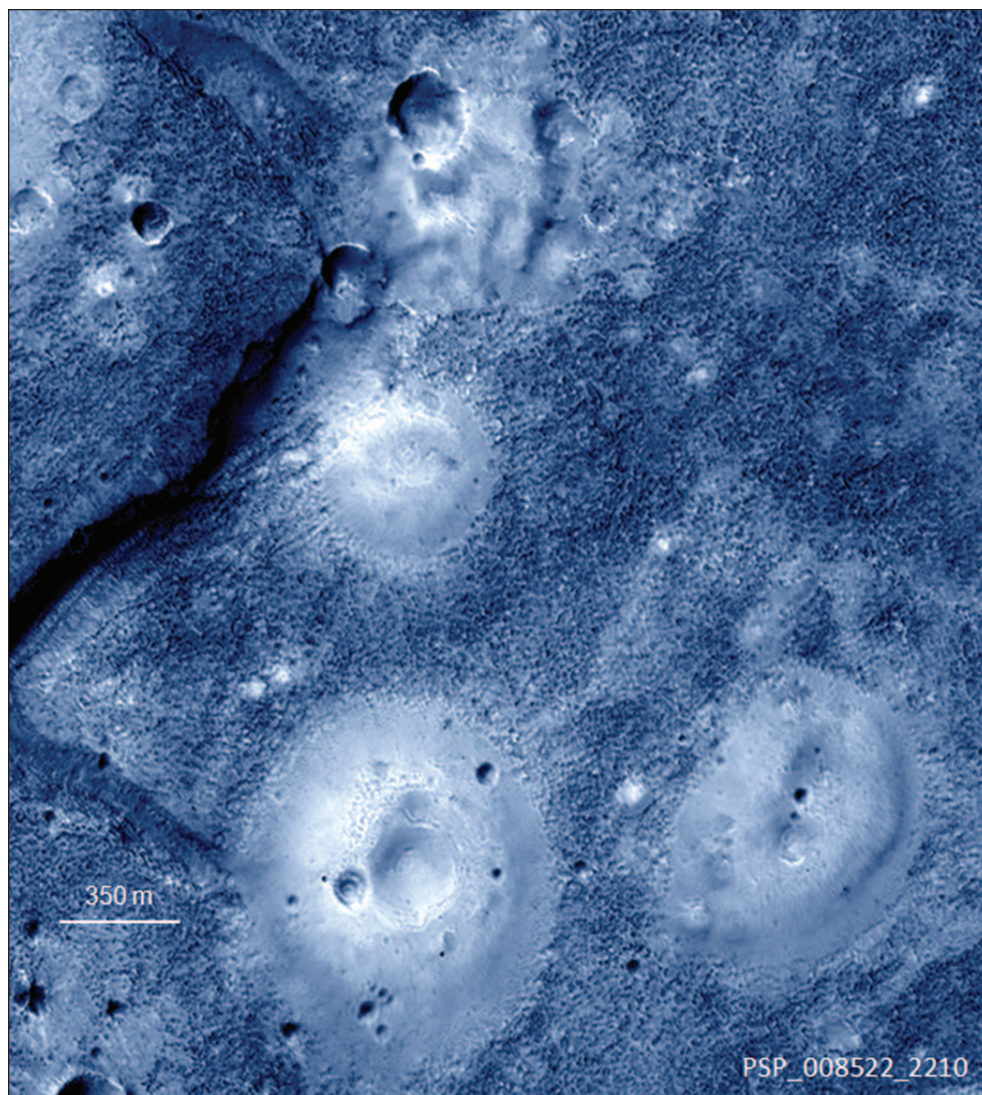


Fig. 1. Mounds in Acidalia Planitia, Mars. These features have been compared to terrestrial mud volcanoes.

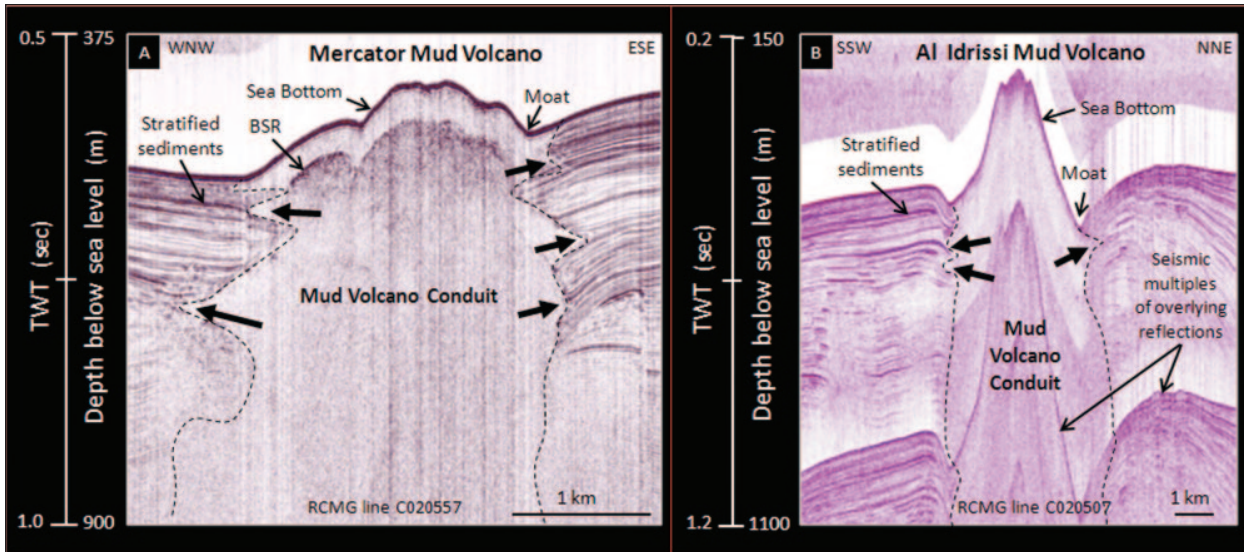


Fig. 2. Seismic profiles of mud volcanoes in the Gulf of Cadiz, offshore Morocco, illustrating the conduits to the surface created by these types of structures. Thick arrows point to levels where mudflows interfinger with the stratified sediments in the subsurface.

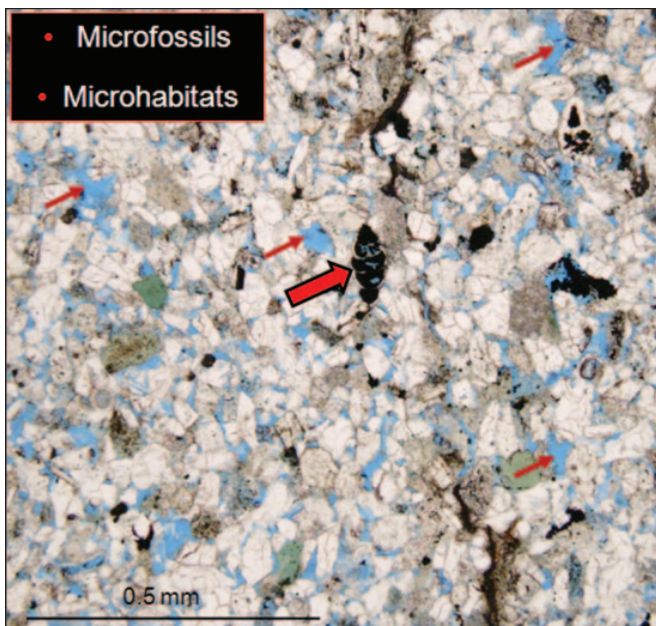


Fig. 3. Coarse-grained sediment brought to the surface by a terrestrial mud volcano, illustrating microhabitats. Optical photomicrograph in transmitted light of a thin section. Large red arrow points to microfossil. Small red arrows illustrate potential microhabitats in porosity (shown in blue from tinted epoxy).